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Application No. 09/427,386

coordinates and the contents of both motor controllers' position registers so as to determine the present position of the telescope system with respect to the spherical coordinate system.

REMARKS

Claims 55 – 88 are in the application with claims 1- 46 having been cancelled and claims 47 - 54 having been withdrawn from consideration. Of the claims under consideration, claims 55, 61, 69, 75 and 77 are the independent claims. A clean set of claims is also appended hereto.

Since claims 1-46 have been cancelled, applicants submit that the various rejections of those claims under 35 U.S.C. § 112 second paragraph, 35 U.S.C. § 102(e) and 35 U.S.C. § 103(a) are now moot.

Reconsideration of further examination are respectfully requested.

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Respectfully submitted,

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IN THE CLAIMS

Please cancel claims 1-46.

55. (New) An automated telescope system of the type including a telescope mounted for rotation about two substantially orthogonal axes, the automated telescope system comprising:

first and second motor portions, each coupled to rotate the telescope about a respective one of the axes, each motor portion including:

a motor having a rotatable shaft;

an incremental encoder coupled to the motor shaft, the encoder outputting signals corresponding to an amount of movement of its respective motor; and

an intelligent motor control processor, comprising a position register, the register storing a calculated actual extent of motor movement, the motor control processor coupled to receive encoder signals from a respective incremental encoder, the intelligent motor control processor calculating and outputting motor control commands in operative response thereto; and

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a command processor operatively coupled to the motor portions, the command processor receiving an input representing a position of a desired viewing object, the position characterized in terms of a celestial coordinate system, the command processor further receiving an input representing a present position of the telescope, the telescope position characterized in terms of a rectangular coordinate system, the command processor calculating a rotational movement about each of the respective axes to move the telescope from its present position to the position of the desired viewing object and outputting each axial rotational movement to a respective motor control processor as motor movement commands;

wherein each motor control processor translates received motor movement commands into motor control commands, each motor control processor commanding motor movement and receiving encoder signals corresponding to actual motor movement, the motor control processor processing received encoder signals to calculate an actual extent of motor movement, and wherein each motor control processor provides its register contents to the command processor, the command processor translating the register contents into telescope angular displacement about the corresponding axis to calculate thereby a present telescope position

56. (New) The telescope system according to claim 55, wherein the signals output by the incremental encoder correspond to increments of the encoder, a timing between increments

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corresponding to a speed of movement and an amount of increments corresponding an extent of movement.

57. (New) The telescope system according to claim 56, wherein the incremental encoder comprises an optical encoder operating in quadrature, the motor control processor processing the quadrature signal to determine motor speed and motor rotation direction.

58. (New) The telescope system according to claim 57, wherein the motor control processor increments the position register with a received extent of movement when the motor rotates in a first direction and wherein the motor control processor decrements the position register with a received extent of movement when the motor rotates in a second direction.

59. (New) The telescope system according to claim 54, further comprising:

a celestial object database coupled to the command processor, the database containing entries each associating a celestial object with a corresponding set of celestial coordinates; and

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wherein the command processor receives an input corresponding to a desired celestial object to view, the command processor accessing the corresponding set of celestial coordinates from the database, the command processor further processing the celestial coordinates and rectangular coordinates representing the present position of the telescope system so as to calculate a dynamic movement profile for each axis so as to track the desired celestial object's motion.

60. (New) The telescope system according to claim 59, wherein the command processor translates each axis' dynamic movement profile into motor speed and direction commands and outputs said motor commands to the corresponding motor control processor, the motor control processor controlling motor movement in response thereto, thereby freeing the command processor to perform further processing and calculation tasks during telescope movement.

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61. (New) An automated telescope system of the type including a telescope mounted for rotation about an altitude and an azimuth axis, the automated telescope system comprising:

a command processor, the command processor receiving an input representing a position of a desired viewing object, the position characterized in terms of a celestial coordinate system, the command processor translating the input into a position characterized in terms of an altitude/azimuth coordinate system, the command processor calculating an amount of movement about each axis, to move the telescope from a present position to a desired position which points the telescope at the desired viewing object, the command processor outputting motor movement commands for each respective axis; and

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two intelligent motor portions, each coupled to rotate the telescope about a respective one of the axes, each motor portion including :

a motor having a rotatable shaft;

a motion indicator coupled to the motor, the motion indicator developing motion indication signals corresponding to actual motor movement; and

an intelligent motor control processor, coupled to the motor and the motion indicator, the motor control processor further coupled to receive motor movement commands from the command processor, the motor control processor processing each respective motor movement command into motor control commands defining operational movement of the motor, the motor control processor further receiving motion indication signals and comparing actual operational movement of its respective motor to commanded operational movement, the motor control processor modifying motor control commands in response to differences therebetween.

62. (New) The telescope system according to claim 61, the motor control processor including a position register, the register storing a calculated actual extent of motor movement wherein the motor control processor provides the register contents to the command processor, the command processor translating the register contents into telescope angular displacement about the corresponding axis and thereby into a present telescope position.

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63. (New) The telescope system according to claim 61, wherein the motion indicator comprises an incremental encoder, the motion indication signals corresponding to increments of the encoder, a timing between increments corresponding to a speed of movement and an amount of increments corresponding an actual extent of movement.

64. (New) The telescope system according to claim 63, wherein the incremental encoder comprises an optical encoder operating in quadrature, the motor control processor processing the quadrature signal to determine motor speed and motor rotation direction.

65. (New) The telescope system according to claim 64, wherein the motor control processor increments the position register with an actual extent of movement when the motor rotates in a first direction and wherein the motor control processor decrements the position register with an actual extent of movement when the motor rotates in a second direction.

66. (New) The telescope system according to claim 61, further comprising:

a geographic location database coupled to the command processor, the database containing entries each associating a geographic place name with a corresponding set of earth-based coordinates; and

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wherein the command processor receives a place name input corresponding to a geographic location proximate to a user, the command processor processing the corresponding set of earth-based coordinates and the contents of both motor controller's position registers so as to determine the present position of the telescope system with respect to the celestial coordinate system.

67. (New) The telescope system according to claim 66, further comprising:

a celestial object database coupled to the command processor, the database containing entries each associating a celestial object with a corresponding set of celestial coordinates; and

wherein the command processor receives an input corresponding to a desired celestial object to view, the command processor processing the corresponding set of celestial coordinates and the present position of the telescope system so as to calculate an amount of altitude and azimuth axis movement sufficient to point the telescope to the desired celestial object, the command processor further calculating a dynamic movement profile for each axis so as to track the desired celestial object's motion.

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68. (New) The telescope system according to claim 67, wherein the command processor translates each axis' dynamic movement profile into motor speed and direction commands and outputs said motor commands to the corresponding motor control processor, the motor control processor controlling motor movement in response thereto, thereby freeing the command processor to perform further processing and calculation tasks during telescope movement

69. (New) In an automated telescope system of the type including a telescope mounted for rotation about two substantially orthogonal axes, a method for operating the system comprising:

retrieving an input representing a position of a desired viewing object, the position characterized in terms of a celestial coordinate system;

processing the input in a command processor into a position characterized in terms of a rectangular coordinate system, the command processor determining a present position about each axis, and calculating a displacement in the rectangular coordinate system for each axis to point the telescope at the desired viewing object;

processing each axial displacement into motor movement commands for that axis;

outputting each motor movement command to a corresponding motor control processor coupled to that axis;

processing each respective motor movement command, in each said respective motor control processor, into motor control commands defining operational movement of a motor coupled to each respective axis;

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operating each motor in accordance with its motor control commands;

evaluating actual operational movement of each motor by a motion sensor, the sensor developing motion indication signals corresponding to an amount of motor rotational movement, the evaluating step including:

reading an amount of motor rotational movement;

calculating a total amount of motor movement;

recording the total amount as a content of a position register; and

providing the register contents to the command processor, wherein the command processor translates the register contents into telescope angular displacement about the corresponding axis and thereby a present telescope position.

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70. (New) The method according to claim 69, wherein each respective motor control processor compares actual operational movement of its respective motor to commanded operational movement and modifies motor control commands in response to differences therebetween.

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71. (New) The method according to claim 69, wherein the motion sensor comprises an incremental encoder, the motion indication signals corresponding to increments of the encoder, a timing between increments corresponding to a speed of movement and an amount of increments corresponding an extent of movement

72. (New) The method according to claim 71, wherein the incremental encoder comprises an optical encoder operating in quadrature, the motor control processor processing the quadrature signal to determine motor speed and motor rotation direction.

73. (New) The method according to claim 72, further comprising:

incrementing the contents of the position register with an extent of movement when the motor rotates in a first direction; and

decrementing the contents of the position register with an extent of movement when the motor rotates in a second direction.

74. (New) The method according to claim 69, further comprising:

accessing a celestial object database coupled to the command processor, the database containing entries each associating a celestial object with a corresponding set of celestial coordinates; and

providing an input corresponding to a desired celestial object to view;

providing the corresponding set of celestial coordinates from the database;

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retrieving the corresponding set of celestial coordinates and the present position of the telescope system so as to calculate an amount of altitude and azimuth axis movement sufficient to point the telescope to the desired celestial object;

calculating a dynamic movement profile for each axis so as to track the desired celestial object's motion.

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translating each axis' dynamic movement profile into motor speed and direction commands; and

outputting said motor commands to the corresponding motor control processor, wherein the motor control processor controls motor movement in response thereto, thereby freeing the command processor to perform further processing and calculation tasks during telescope movement.

75. (New) In an automated telescope system of the type including motors coupled to rotate the telescope about an altitude axis and an azimuth axis, a method for operating the system comprising:

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activating a command processor, the command processor performing the steps of:

retrieving an input representing a position of a desired viewing object, the position of the desired viewing object characterized in terms of a celestial coordinate system;

calculating a present position of the telescope, the present position characterized in terms of a rectangular coordinate system;

calculating an amount of movement by the telescope, in said rectangular coordinate system, about each axis which will point the telescope at the desired viewing object;

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translating a movement amount for each axis into a motor movement command for that axis; and

providing each axial motor movement command to a motor control processor coupled to operate that axis' respective motor;

operating an altitude and an azimuth motor control processor, each coupled to the respective axis, each motor control processor performing the steps of:

translating axial motor movement commands received from the command processor into motor control commands;

operating each axis' motor in response to its respective motor control commands;

receiving signals corresponding to actual motor rotational movement, said signals sensed by an incremental encoder coupled to the motor;

establishing a record of its respective motor's total rotational movement; and

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providing the record of each motor's total rotational movement to the command processor; and

wherein the command processor translates each record into telescope angular displacement about the respective axis and, thereby the present position vector of the telescope.

76. (New) The method according to claim 75, the command processor further performing the steps of:

calculating a dynamic movement profile for each axis so as to track the desired celestial object's motion.

translating each axis' dynamic movement profile into motor speed and direction commands for each axis; and

outputting said motor commands to the corresponding motor control processor for that axis, wherein the motor control processor controls motor movement in response thereto, thereby freeing the command processor to perform further processing and calculation tasks during telescope movement.

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15 ~~77.~~ (New) An automated telescope system of the type including a telescope mounted for rotation about two substantially orthogonal axes, the automated telescope system comprising:

first and second motor portions, each coupled to rotate the telescope about a respective one of the axes, each motor portion including:

a motor having a rotatable shaft;

an encoder coupled to the motor shaft, the encoder outputting signals corresponding to an amount of movement of its respective motor; and

a motor control processor, configured to receive encoder signals from a respective encoder, the motor control processor calculating and outputting motor control commands in operative response thereto, the motor control processor including a position register, the register storing a calculated actual extent of motor movement; and

a command processor operatively connected to the motor portions, the command processor receiving an input corresponding to a position of a desired viewing object, the command processor further receiving an input corresponding to present position of the telescope, the command processor calculating a rotational movement about each of the axes to move the telescope from its present position to the position of the desired viewing object and outputting a corresponding motor movement command to each respective motor control processor.

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78. (New) The telescope system according to claim 77, wherein each motor control processor translates received motor movement commands into motor control commands, each motor control processor commanding motor movement and receiving encoder signals corresponding to actual motor movement, each motor control processor providing its register contents to the command processor, the command processor translating the register contents into telescope angular displacement about the corresponding axis to calculate thereby a present telescope position, the motor control processor processing received encoder signals to calculate an actual extent of motor movement.

79. (New) The telescope system according to claim 78, wherein the input corresponding to a position of a desired viewing object is characterized in terms of a celestial coordinate system.

80. (New) The telescope system according to claim 79, wherein the input corresponding to a present position of the telescope is characterized in terms of a rectangular coordinate system.

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81. (New) The telescope system according to claim 77, wherein the signals output by the encoder correspond to increments of the encoder, a timing between increments corresponding to a speed of movement and an amount of increments corresponding to an extent of movement.

82. (New) The telescope system according to claim 81, wherein the incremental encoder comprises an optical encoder operating in quadrature, the motor control processor processing the quadrature signal to determine motor speed and motor rotation direction.

83. (New) The telescope system according to claim 82, wherein the motor control processor increments the position register with a received extent of movement when the motor rotates in a first direction and wherein the motor control processor decrements the position register with a received extent of movement when the motor rotates in a second direction.

84. (New) The telescope system according to claim 83, wherein the automated telescope system is of the type including a telescope mounted for rotation about an altitude and an azimuth axis.

85. (New) The telescope system according to claim 77, further comprising:

a celestial object database coupled to the command processor, the database containing entries each associating a celestial object with a corresponding set of celestial coordinates; and

wherein the command processor receives an input corresponding to a desired celestial object to view, the command processor processing the corresponding set of celestial coordinates and the present position of the telescope system so as to calculate an amount of altitude and azimuth axis movement sufficient to point the telescope to the desired celestial object.

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86. (New) The telescope system according to claim 85, wherein the command processor further calculates a dynamic movement profile for each axis so as to track the desired celestial object's motion.

87. (New) The telescope system according to claim 86, wherein the command processor translates each axis' dynamic movement profile into motor speed and direction commands and outputs said motor commands to the corresponding motor control processor, the motor control processor controlling motor movement in response thereto, thereby freeing the command processor to perform further processing and calculation tasks during telescope movement.

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88. (New) The telescope system according to claim 87, further comprising:

a geographic location database accessible to the command processor, the database containing entries each associating a geographic place name with a corresponding set of earth-based coordinates; and

wherein the command processor receives a place name input corresponding to a geographic location proximate to a user, the command processor processing the corresponding set of earth-based coordinates and the contents of both motor controllers' position registers so as to determine the present position of the telescope system with respect to the spherical coordinate system.

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